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METHOD FOR SWITCHING CONNECTIONS BETWEEN AT LEAST TWO SUBREGIONS OF A PACKET-ORIENTED NETWORK

Background of the Invention:

Field of the Invention:

In connectionless, packet-oriented networks, such as on the Internet or in networks based on ITU-T Standard H.323, no quality of service is guaranteed for connections between terminals in the networks. The quality of service also includes the bandwidth and the transmission speed that is provided for a connection.

In the case of voice transmission in local area networks, that is to say in packet-oriented networks, the quality of service is assured by over dimensioning the transmission system resources, since high bandwidths can be achieved inexpensively in local area networks. Frequently, subregions of local area networks - for example company-internal communication networks - are connected to one another to form one local area network. Since the subregions of the local area networks are usually provided at geographically different locations, leased lines are usually provided for the connections between the subregions. To assure a sufficient quality of service for connection paths routed between the subregions, there must

only be as many connections routed via the connection path between the networks as there are available transmission system resources, a transmission system resource being demanded for each connection during connection initialization. In most applications, central units are provided which coordinate and monitor the connections within a subregion. By way of example, a packet-oriented multimedia communication system based on ITU-T Standard H.323 contains gatekeepers or bandwidth managers which control and monitor data links and voice links - and in the case of access to the Internet, also Voice over Internet links. In this context, it is a complex matter to monitor the bandwidth for each individual connection over the data paths for all initialized connections beyond the respective subregions as well. To do this, it is necessary to know the exact switching paths for the connections within the subregions or within the local area network. However, the very high level of complexity results in that such implementation is not economical in the gatekeepers of the multimedia communication systems based on Standard H.323.

Another alternative for assuring the quality of service in connections routed between subregions of a local area network is to over dimension the connection paths between the subregions of the local area network. Such a solution requires a high level of additional technical and hence also financial input.

Summary of the Invention:

It is accordingly an object of the invention to provide a method for switching connections between at least two subregions of a packet-oriented network which overcomes the above-mentioned disadvantages of the prior art methods of this general type, in which it is assured that the quality of service for connections routed between subregions of a packet-oriented network via connection paths having prescribed transmission system resources is provided.

With the foregoing and other objects in view there is provided, in accordance with the invention, a method for assuring quality connections between at least two subregions of a packet-oriented network, at least one connection path between the subregions has a prescribed scope of transmission system resources. The method includes the steps of providing each of the subregions with an associated item of subregion information; signaling the associated item of subregion information associated with an originating subregion and a destination subregion and also signaling requested resources, if a connection is initialized; and authorizing the connection to be initialized from the originating subregion to the destination subregion taking into account the requested resources and the transmission system resources available between the subregions.

The fundamental aspect of the method according to the invention is that each subregion has an associated item of subregion information, and, when a connection is initialized, the item of subregion information associated with the origin subregion and the destination subregion and also a resource request are signaled. A connection which is to be initialized from one subregion to another subregion is authorized taking into account the requested resources and the available scope of transmission system resources between the subregions. Preferably, the item of subregion information is represented by an item of user group information, the latter being indicated by an additional item of address information or dialing information, or by an association between groups of address information items for the network and the subregions, or by an association between groups of Layer 2 information items and the subnetworks, or by an association between parts of an item of address information or dialing information and the subregions, or items of organizational information for the subregions.

One fundamental advantage of the method according to the invention can be seen in that the connections which are to be passed between the subnetworks are recognized centrally in the subregions on account of the item of address information which identifies a subregion, and the knowledge about the prescribed

transmission system resources between the origin subregion and the destination subregion can be used as a basis for controlling or authorizing the connections via the connection path having the prescribed transmission system resource. Therefore, connections having a requested transmission system resource or a transmission speed that is used to pass at least one connection path between the subregions are no longer available as transmission system resources. This significantly increases the quality of service, and the additional or associated item of address information or organization information, which each define a user group or a subregion, and the requested transmission system resources allow the available transmission system resources between the subregions to be checked and a statement to be made regarding the authorization of an initialized connection.

In accordance with one variant embodiment of the method according to the invention, the subregions of the network can be subdivided into further subranges, the further subranges each having been allocated some of the transmission system resources of the at least one transmission path. The subranges are advantageously represented by user groups having different services or service classes. Therefore, for different services, the quality of service or the prescribed transmission system resources can be determined differently for each service.

In accordance with another advantageous embodiment of the method according to the invention, the quality of service of the connections in at least one of the packet-oriented subnetworks is assured for at least one other subnetwork. Therefore, not every gatekeeper - in the case of H.323 networks - or a unit controlling the connections in the respective subregion need have a controller in line with the method according to the invention. This further reduces the level of financial input.

In the case of a network based on ITU-T Standard H.323, the subregions are advantageously formed by local zones, with a gatekeeper being provided at least in one of the subregions for switching connections and voice links. In accordance with another advantageous variant, the subregions are formed by Internet sections, with part of the Internet address determining an Internet section. In this case, the method according to the invention can be implemented with particular advantage in at least one of the Internet sections, which may be based on a packet-oriented network in accordance with Standard H.323.

The prescribed transmission system resources are advantageously determined by an item of bandwidth information or by a number of connections having prescribed items of

bandwidth information. The bandwidth information defines, in particular, average or peak transmission rates or transmission speeds.

When there are a plurality of connection paths between the subregions, the transmission system resources are prescribed for each connection path and together form the prescribed transmission system resources. In this context, each of the connection paths or each of the transmission system resources can be monitored on the basis of the method according to the invention.

In accordance with another variant of the method according to the invention, the items of subregion information can be allocated different switching priorities. This variant is used advantageously when connections for individual services need to be given preferential treatment over connections for other services.

Other features which are considered as characteristic for the invention are set forth in the appended claims.

Although the invention is illustrated and described herein as embodied in a method for switching connections between at least two subregions of a packet-oriented network, it is nevertheless not intended to be limited to the details shown,

since various modifications and structural changes may be made therein without departing from the spirit of the invention and within the scope and range of equivalents of the claims.

The construction and method of operation of the invention, however, together with additional objects and advantages thereof will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

Brief Description of the Drawing:

The single figure of the drawing is a block diagram of a packet oriented network according to the invention.

Description of the Preferred Embodiments:

Referring now to the single figure of the drawing, there is shown a packet-oriented network, in particular a packet-oriented local area network LAN, which is formed by two subregions NB1, NB2. The two subregions NB1, NB2 are connected by a connection path VS, with the connection path VS being connected to a router R in the respective subregions NB1, NB2. The router R is a linking element between transmission networks NL of the subregions NB1, NB2 of the local area network LAN. The router R checks origin addresses and destination addresses SA, DA, and, if there is a destination address which is not associated with the

particular subregion NB1, NB2, the packet is switched to the other subregion NB1, NB2. In the illustrative embodiment, it may be assumed that the local area network LAN in the form of a bus is involved, with the bus-like transmission links of the subregions NB1, NB2 being connected via the routers R and the connection path VS.

In addition, terminals in the form of personal computers PC are connected to the transmission links NL of the subregions NB1, NB2. For the illustrative embodiment, it may also be assumed that the local area network LAN or the subregions NB1, 2 are configured in accordance with ITU-T Standard H.323, and, for connection control and monitoring, the first subregion NB1 contains a central gatekeeper ZGK which performs these functions for both subregions NB1, NB2.

The first subregion NB1 is, by way of example, the central communication network of a company central control station, and the second subregion NB2 is a branch office of the company. It may also be assumed for the illustrative embodiment that both subregions NB1, NB2 of the local area network LAN are connected to the Internet INT by an access device ZE connected in the first subregion NB1. Therefore, not only the Internet links but also Voice over Internet links are initialized and routed among the personal computers PC or

to the Internet INT. If the local area network LAN is part of the Internet INT, then the access device ZE is dispensed with.

Each of the terminals or personal computers PC and the central gatekeeper ZGK have both a physical Layer 2 address L2A and an Internet address IA associated with them. For transmitting voice information within the local area network LAN and also to or from the Internet INT, a respective Voice over Internet function VoIP is provided in the terminals or personal computers PC. In this context, normal telephone numbers rn can be used as addresses for initializing or setting up connections V.

According to the invention, each of the subregions NB1, NB2 is now allocated an item of subregion information. Such an item of subregion information may be represented by part of the Internet address IA or part of the Layer 2 address L2A or else part of the telephone numbers rn. Thus, by way of example, the first subregion of the Internet address IA, or a subregion of the Internet address that is disposed between two points of the Internet address IA, can be used for determining an item of subregion information or user group information. In the illustrative embodiment, in the central region of the Internet address IA, the item of user group information 0111 is associated with the first subregion NB1, and the item of user group information 0110 is associated with the second subregion

NB2. Alternatively, this association can be made using the Layer 2 addresses L2A or parts of the Layer 2 addresses or the telephone numbers rn, with a prefix, i.e. a preceding additional telephone number or item of address information, also being possible in the case of the telephone numbers rn.

Within the context of the connection V initialized by the personal computer PC, the connection V is signaled or indicated to the central gatekeeper ZGK. In this case, a destination address and an origin address DA, SA have been entered in the header of the packet indicating the initialization. Since the central gatekeeper ZGK is responsible both for the first and the second subregion NB1, NB2, the connection(s) V initialized both by the first and the second subregion NB1, NB2 are signaled to the central gatekeeper ZGK. The central gatekeeper ZGK stores the information that a connection path VS having a prescribed transmission system resource TR exists between the first and the second subregion NB1, NB2. By way of example, the transmission system resources can be provided by a transmission link having a transmission speed of 128 kbit/sec. Within the context of the connection V being signaled to the central gatekeeper ZGK, the latter checks whether the personal computer PC determined by the destination address DA or the access device ZE in the first or in the second subregion NB1, NB2 is connected to the local area network LAN. If the

personal computer PC or the access device ZE intended to be used for communication is disposed in the respective other subregion NB1, NB2, that is to say the connection V is routed via the two routers R and the connection path VS, a check is also carried out to determine how many of the transmission system resources TR are available in the transmission link VS. On the basis of the transmission system resources TRV requested with the signaling of the connection V, the central gatekeeper ZGK can check whether the available transmission system resources TR are still sufficient for the signaled connection V. If the transmission system resources TR are available, an appropriate message is sent to the personal computer PC signaling the connection or to the access device ZE. If the transmission system resources TR are not available, an announcement indicating lack of availability is transmitted to the personal computer PC signaling the connection or to the access device ZE, as a result of which the communication with the personal computer PC determined by the item of destination information DA is terminated.

After initialization and authorization, the requested transmission system resources TRV for the connection V are added to the currently available transmission system resources TR and represent the available transmission system resources TR for other connections V. If the connection V is terminated, its requested transmission system resources TRV

are released again, i.e. are subtracted from the currently available transmission system resources TR.

To give preference to particular services, for example to the Voice over Internet service VoIP, a priority can be allocated to a group of personal computers PC within a subregion NB of the local area network LAN. The allocation of priorities can be achieved by subdividing the subregions NB1, NB2 into further subregions and giving the subdivided subregions preferential treatment, that is to say handling them with priority during connection control in the central gatekeeper ZGK and in the routers R.

If a plurality of connection paths VS are provided between the subregions NB, then the prescribed or maximum available transmission system resources TR can be stored in the central gatekeeper ZGK for each of the connection paths VS. In this context, with another subgroup of the subregions NB1, NB2, for example, each subgroup can be allocated the connection path VS or some of the transmission system resources TR of the connection paths VS. Alternatively, the transmission system resources TR of all the connection paths VS may be regarded as a single transmission system resource for connections from one subregion NB1 to the other subregion NB2.

The method according to the invention is not limited to this illustrative embodiment, but rather can be used in all packet-oriented networks having a plurality of subregions with a different geographical configuration, it being possible for the subregions to be connected to one another by different connection paths - for example optical connection paths or radio links or infrared links. In addition, the method according to the invention can be implemented in subregion controllers in each of the subregions or else in one central controller for the entire packet-oriented network. In this context, there is merely a need for adjustments in line with the transmission protocols and initialization procedures used in the subregions and in the packet-oriented network.